REMARKS

This amendment is responsive to the Office Action mailed February 2, 2004 in connection with the above-identified patent application. In that Action, the drawings and Abstract of the Disclosure were objected to. Claims 1, 11-18, and 20-29 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Claims 1, 12-17, and 19-29 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Claims 11, 12, 15-18, 24, and 26-29 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,647,803 to von der Heide, et al. Claims 11 and 18 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,365,388 to Maughan, et al. Claims 11 and 18 were also rejected under 35 U.S.C. § 102(b) as being anticipated by Japan Patent JP 05-199,721 to Takahashi. Claim 1 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi '721 in further view of von der Heide, et al. '803. Claims 13, 14, and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over von der Heide, et al. '803 in further view of British Patent GB 2,293,695 to Norton, et al. Claims 20-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over von der Heide, et al. '803 in further view of Japanese Patent JP 09-149,602 to Komatsu. Lastly, claim 23 was rejected under 35 U.S.C. § 103(a) as being unpatentable over von der Heide, et al. '803 and Komatsu '602.

The Present Application:

For purposes of review, the present application is directed to an electromotive drive system for use with a pump of a power-assisted steering system in a motor vehicle. One advantage offered by the invention of the application is that an electromotive drive for the pump is provided wherein disturbing noises caused by vibrations are reduced and/or prevented. Prior art electromotive drive systems included a rigid coupling between a stator and a shaft support system. This generated a "tuning fork" effect when the resonant frequency of the system falls in the range of the unavoidable high frequency torque vibrations. Such torque variations or vibrations are particularly unavoidable with electric motors and which have sufficient amplitude to lead to the disturbing noises, especially when the pump is operated with a full load.

In accordance with one aspect of the present invention, the rigid coupling between the stator and the shaft support is eliminated with respect to torque transmission. The transmission of the torque moment occurs essentially only via the

coupling of the stator with the remaining housing through an intermediary base plate and not through the shaft support. The shaft support serves only for positioning the stator in the plane which extends transversely in relation to the shaft support.

An improved suppression of the disturbing noises is obtained by providing a gap between the interior wall of the stator and the outer wall of the shaft support. Vibration-absorbing elements are preferably included in the system to maintain the gap and include, for example, O-rings. Also, the gap can be filled at least partially with a viscous medium. The O-rings, however, do not transmit torque between the stator and the shaft support.

In the preferred embodiment of the invention as described in the specification, the torque transmission from the stator to the remaining housing takes place only via a supporting base plate. The base plate preferably includes a punched-out grid. The stator is mounted directly onto the supporting base plate. The base plate is in turn mounted to the motor housing. The support shaft extends from the motor housing and rotatably supports the motor output shaft therein.

More specifically and with reference to the drawing figures of the application, in order to avoid noises which develop with prior art drives in use heretofore, the stator 7 is not joined directly to the shaft support 15. Rather, the shaft support 15 and the stator 7 are arranged such that a gap exists between an inner wall of the stator 7 and an outer wall of the shaft support 15. One or more O-rings 12 are disposed in grooves 12a on the outer wall of the shaft support 15. The O-rings 12 preferably have flexibility and produce a dampening effect, thus acting as vibration-dampening elements between the stator and the shaft support 15. A viscous medium such as a grease or the like can be disposed in the gap between the stator and the shaft. It is to be appreciated that a substantially rigid coupling between the stator 7 and the shaft support 15 is avoided. Such a rigid coupling would support tangential power transmission or the transmission of torque from the stator 7 to the shaft support 15. This is undesirable and avoided in the present application.

In that regard, according to the preferred embodiment, the torque moment is not transmitted from the stator 7 through the shaft support 15. Rather, the torque moment is transmitted directly to the housing 3 through a base plate 19, and, more specifically, to the bottom of the housing 3 through a base plate 119. The shaft support 15, aside from providing a mounting for the rotor shaft 18, serves only to provide axial

control or stabilization of the stator 7.

Since the base plate 19 is firmly mounted together with the attached stator 7 in the housing 3, the torque moment transmission from the stator to the housing 3 takes place via the base plate 19. Also, the base plate 19 is not rigidly connected over its entire area with the housing 3, but rather is connected only in certain selected areas or spots. This arrangement produces an additional benefit in that the base plate 19, which typically has some flexibility, acts to dampen the high frequency variations of the transmitted torque. This additional benefit is obtained in particular when the base plate 19 is at least partially formed as an extrusion plastic-coated punched-out grid. The vibration dampening properties of the base plate 19 are particularly evident when the base plate 19 is not rigidly connected over its entire area with the housing 3 but rather is connected only in certain selected areas or spots such as, for example, is connected by means of screws or the like.

U.S. Patent No. 4,647,803 to von der Heide, et al.:

U.S. Patent No. 4,647,803 to von der Heide, et al. teaches an electric motor provided with an air gap between a stator and a rotor of the electric motor. However, the stator is attached to a rotor shaft support in a manner as described with regard to the prior art of the instant application. To that end, the attachment of the stator directly to the shaft support is in direct contradiction to one goal of the device of the present invention, namely, to divorce the stator from the bearing shaft support. In von der Heide, et al., in order to reduce noise emissions, the stator is connected to the bearing support by means of an elastic damper and the stator and bearing support are separated from one another by an air gap adjacent at least part of their facing faces.

Again, the von der Heide, et al. stator is connected directly to the bearing support rather than to the housing without rigid connection to the bearing support as in the present application.

Japanese Patent JP 5-199,721:

The Japanese Patent JP 5-199,721 to Takahashi teaches a motor adapted to suppress an phenomena of a vibrating printed circuit board fixed with a stator of a brushless DC motor in an axial direction caused by mutual operation by magnetic attraction and repulsion between a stator core and a rotor magnet. As shown

in the drawing figure of the Takahashi '721 patent, a stator core 10 of a brushless DC motor is fixed to a printed circuit board 13. An outer periphery of the board 13 is clamped with an upper surface 6a of a housing using screws. The surface 6a of the housing is formed at its inner periphery higher than its outer periphery. Thus, mounting rigidity of the board 13 is enhanced and an axial vibration is suppressed to reduce noise. Thus, the deterioration of rotating performance of the motor can be prevented by contact of the rotor surface of the printed circuit board 13 with the upper surface 6a of the housing.

It is to be appreciated that in Takahashi '721, the entire bottom surface of the printed circuit board 13 is in contact with the upper surface 6a of the housing to suppress axial vibration of the housing.

THE NON-ART REJECTIONS

Referring once again to the Office Action, both the drawings and Abstract of the Disclosure were objected to. With regard to the drawings, the Examiner took the position that the stator supported exclusively by the base plate and the stator supported without connection to the housing and supported exclusively by the base plate must be shown or the features canceled from the claims. Applicants have canceled the language of the stator being supported without connection to the housing from the claims. Accordingly, it is respectfully submitted that the drawings are in proper form and show every feature of the invention specified in the claims.

Next, with regard to the Abstract of the Disclosure, the Examiner took the position that the Abstract contains legal language which is not appropriate under M.P.E.P. § 608.01(b). Applicants have tendered an amendment to the Abstract of the Disclosure. It is respectfully submitted that the Abstract is now in proper form.

Still further in the Action, claims 1, 11-18, and 20-29 were rejected under 35 U.S.C. § 112, first paragraph because, according to the Examiner, the specification does not enable or contain a full, clear, concise, and exact written description of the stator supported exclusively by the base plate and the stator is supported without connection to the housing.

As noted above, applicants have amended the claims to cancel the language noted by the Examiner above, particularly, the language of the stator being supported without connection to the housing. For at least this reason, applicants

respectfully submit that all pending claims are in condition for allowance under 35 U.S.C. § 112, first paragraph.

Lastly in the Office Action, claims 1, 12-17, and 19-29 were rejected under 35 U.S.C. § 112, second paragraph because it was unclear to the Examiner how the stator can be retained by the shaft support or have a flexible couple with the shaft support, while at the same time being solely supported by the base plate.

Again, applicants have tendered an amendment to the claims above to delete the language of the stator being supported solely by the base plate relative to the housing. For at least this reason, applicants respectfully submit that all pending claims are in condition for allowance under 35 U.S.C. § 112, second paragraph.

THE ART REJECTIONS

In the Office Action, Claims 11, 12, 15-18, 24, and 26-29 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,647,803 to von der Heide, et al. Claims 11 and 18 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,365,388 to Maughan, et al. Claims 11 and 18 were also rejected under 35 U.S.C. § 102(b) as being anticipated by Japan Patent JP 05-199,721 to Takahashi. Claim 1 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Takahashi '721 in further view of von der Heide, et al. '803. Claims 13, 14, and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over von der Heide, et al. '803 in further view of British Patent GB 2,293,695 to Norton, et al. Claims 20-22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over von der Heide, et al. '803 in further view of Japanese Patent JP 09-149,602 to Komatsu. Lastly, claim 23 was rejected under 35 U.S.C. § 103(a) as being unpatentable over von der Heide, et al. '803 and Komatsu '602.

All Pending Claims are Patentably Distinct And Unobvious Over the Art of Record:

Independent claim 1 recites an electromotive drive comprising a housing, a stator, and a base plate. The housing has a shaft support in which a shaft of a rotor is rotationally mounted. The stator has drive windings and is traversed and retained by the shaft support. The stator is substantially retained in only transversal direction by the shaft support and is connected with the remaining housing for transmission of torque in

a rotationally fixed manner. The base plate supports the stator relative to the housing. The base plate is fastened to the housing and formed as a punched-out grid whereby transmission of a torque moment from the stator to the motor housing occurs solely via the base plate fastened in the housing. Also, he base plate is not rigidly connected over its entire area with the housing.

Applicants respectfully submit that none of the art cited by the Examiner teaches an electromotive drive including a housing, a stator, and a base plate, the base plate supporting the stator relative to the housing, the base plate being fastened to the housing whereby transmission of torque moment from the stator to the housing occurs solely via the base plate fastened in the housing, the base plate being not rigidly connected over its entire area with the housing. As noted above, the vibration dampening properties of the base plate 19 are particularly evident when the base plate 19 is not rigidly connected over its entire area with the housing 3 but, rather, is connected only in certain selected area or spots. As noted above, the primary art references cited by the Examiner teach a stator 16 mounted directly to a shaft support 22 (von der Heide '803) and a base plate 13 having its entire surface area being clamped with and contacting the upper surface 6a of a housing (JP '721). In the electromotive drive recited in claim 1, the base plate is not rigidly connected over its entire area with the housing and a transmission of a torque moment from the stator to the housing occurs solely via the base plate fastened in the housing.

With regard next to independent claim 11, an electromotive drive is recited comprising a housing, a base plate, a stator, a shaft, and a rotor attached to the shaft and surrounding the stator. The base plate is attached to the housing at selected areas of the base plate less than an entire area of the base plate. In addition, the stator surrounds the shaft support and is attached to the base plate whereby torque transmission occurs from the stator to the housing exclusively through the base plate.

As pointed out above, the primary art reference of von der Heide '803 shows a stator 16 being coupled directly to a shaft support member 22 which is incapable of providing a dampening effect between the stator and the shaft support member. In the invention recited in independent claim 11, the stator is mounted to the base plate which is in turn mounted to the housing. Torque transmission occurs from the stator to the housing exclusively through the base plate. The intervening base plate provides substantial advantages and is not taught, suggested, or disclosed in the art

references cited by the Examiner. In JP '721, the entire surface area of the circuit board 13 is in engagement with the housing surface 6a.

Independent claim 24 recites an electromotive drive comprising a housing, a shaft support extending from the housing, a base plate attached to the housing at selected areas of the base plate, the base plate being not connected over its entire area with the housing, a stator spaced apart from the shaft support and being attached to the housing whereby a torque moment is transmitted from said stator to said housing exclusively through the base plate, a shaft rotatably disposed within the shaft support, a rotor attached with the shaft, and a resilient member disposed between the stator and the shaft support.

Independent claim 24 is patentable over the art cited by the Examiner. The primary reference used by the Examiner of the von der Heide '803 patent shows a stator 16 mounted directly to a shaft support member 22. Independent claim 24 includes the limitation of the limitation of the base plate being attached to the housing at selected areas of the base plate, the base plate being not connected over its entire area with the housing. Also, the stator is spaced apart from the shaft support and is directly connected to the base plate whereby a torque moment is transmitted from the stator to the housing exclusively through the base plate. In JP '721, the entire surface area of the circuit board 13 is in engagement with the housing surface 6a.

Independent claim 28 recites a pump motor operative in conjunction with a pump for a hydraulic system of a motor vehicle. The recited pump motor comprises a housing including an elongate shaft support, a stator surrounding the shaft support, a base plate providing a sole route of torque transmission between the stator and the housing and providing dampening between the stator and the housing, the base plate having an area and a selected portion of said area not contacting said housing, a shaft rotatable within the shaft support, a rotor attached with the shaft, and a flexible coupling disposed between the stator and the shaft support.

None of the art cited by the Examiner teaches or suggests a base plate connecting a stator with a housing in the manner set forth in claim 28. At best, the von der Heide '803 patent relied upon by the Examiner teaches a stator 16 mounted directly to a shaft support member 22. This of course does not produce the advantageous results obtained by the present invention of a reduced vibration in the overall system. In JP '721, the entire surface area of the circuit board 13 is in engagement with the

housing surface 6a.

For at least the above reasons, applicants respectfully submit that each of independent claims 1, 11, 24, and 28 are patentably distinct over the art of record. Independent claims 1, 11, 24, and 28 and their respective dependent claims are therefore allowable over the art of record. Allowance of all pending claims and early notice to that effect is respectfully requested.

CONCLUSION

In view of the above amendments, comments, and arguments presented, applicants respectfully submit that all pending claims are patentably distinct and unobvious over the references of record.

Allowance of all claims and early notice to that effect is respectfully requested.

Respectfully submitted,

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